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Nakai et al.

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(54) **CONNECTOR**

(71) Applicant: **Yazaki Corporation**, Tokyo (JP)

(72) Inventors: **Satoshi Nakai**, Shizuoka (JP); **Toru Suzuki**, Shizuoka (JP); **Madoka Ooishi**, Shizuoka (JP)

(73) Assignee: **Yazaki Corporation**, Tokyo (JP)

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(30) **Foreign Application Priority Data**

Oct. 30, 2012 (JP) 2012-238931

(51) **Int. Cl.**

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H01R 13/512	(2006.01)
H01R 103/00	(2006.01)

(52) **U.S. Cl.**

CPC ***H01R 13/5202*** (2013.01); ***H01R 13/5213*** (2013.01); ***H01R 13/6581*** (2013.01); *H01R 13/512* (2013.01); *H01R 13/5208* (2013.01); *H01R 2103/00* (2013.01); *H01R 2201/20* (2013.01)

(58) **Field of Classification Search**

CPC H01R 13/5202; H01R 13/5213; H01R 13/5208

See application file for complete search history.

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Primary Examiner — Ross Gushi
(74) *Attorney, Agent, or Firm* — Sughrue Mion, PLLC

(57) **ABSTRACT**

A connector according to an aspect of the invention is a connector provided with a rear connector that includes a rear housing, and a front connector that includes a front housing and that is assembled to the rear connector; the rear housing contains a terminal of a cable end, and the front housing contains a mating terminal to be connected to the terminal; and the rear housing is provided with a checking window through which the terminal is exposed to outside and a voltage of the terminal can be checked, and a waterproof lid which closes the checking window in a sealed state.

5 Claims, 6 Drawing Sheets

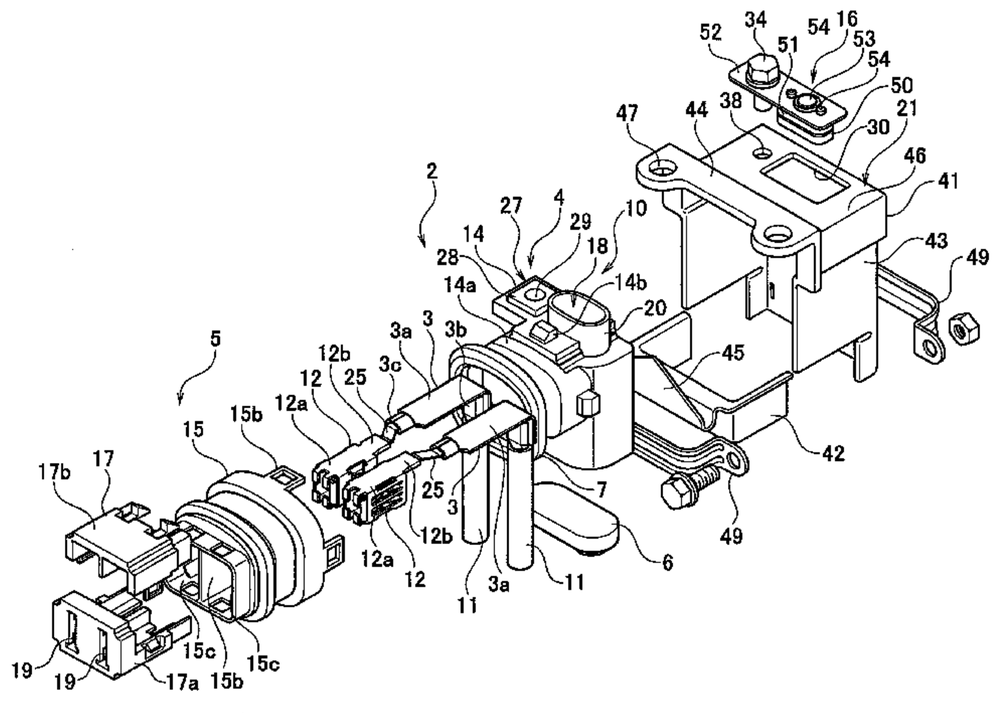

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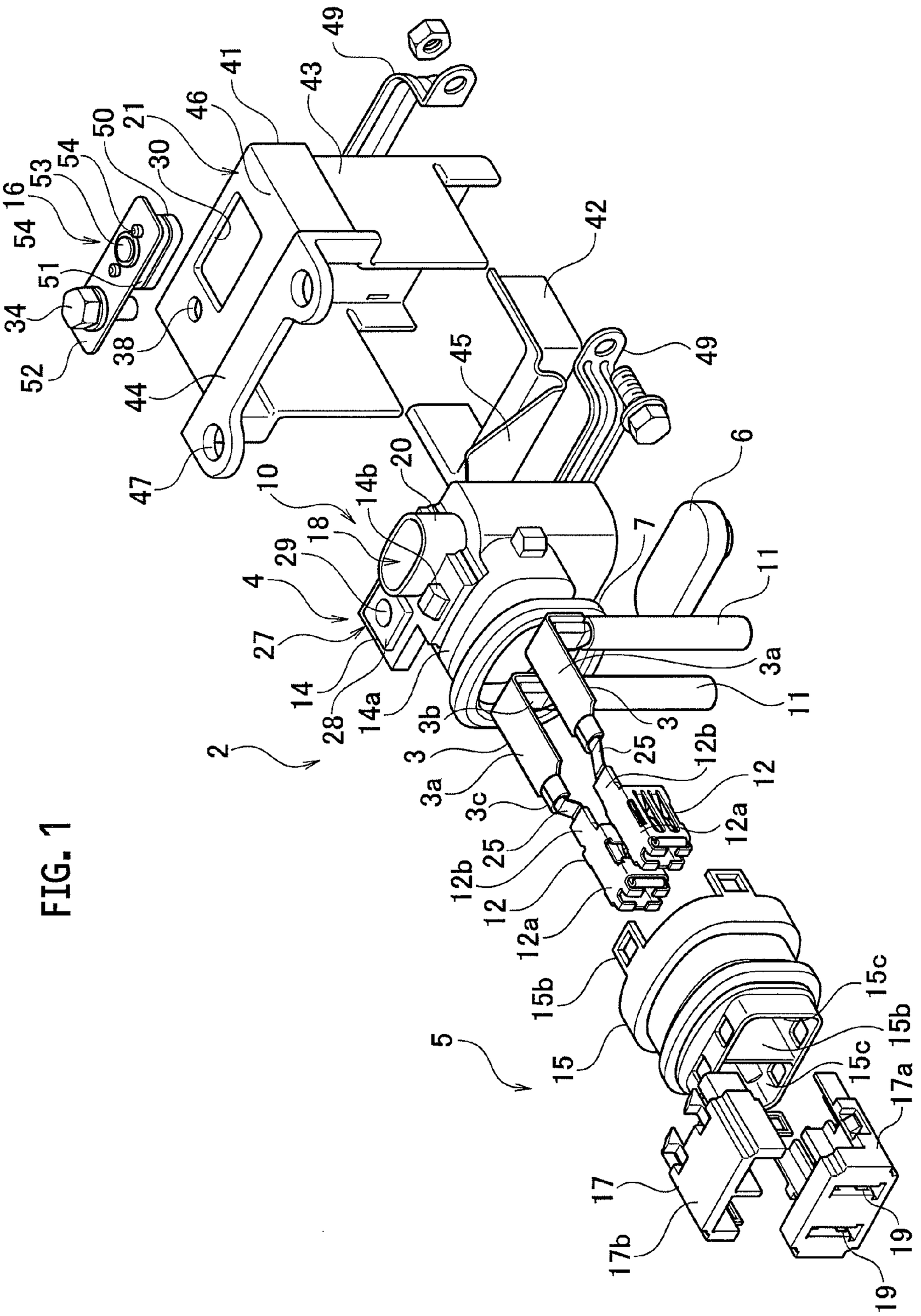
FIG. 1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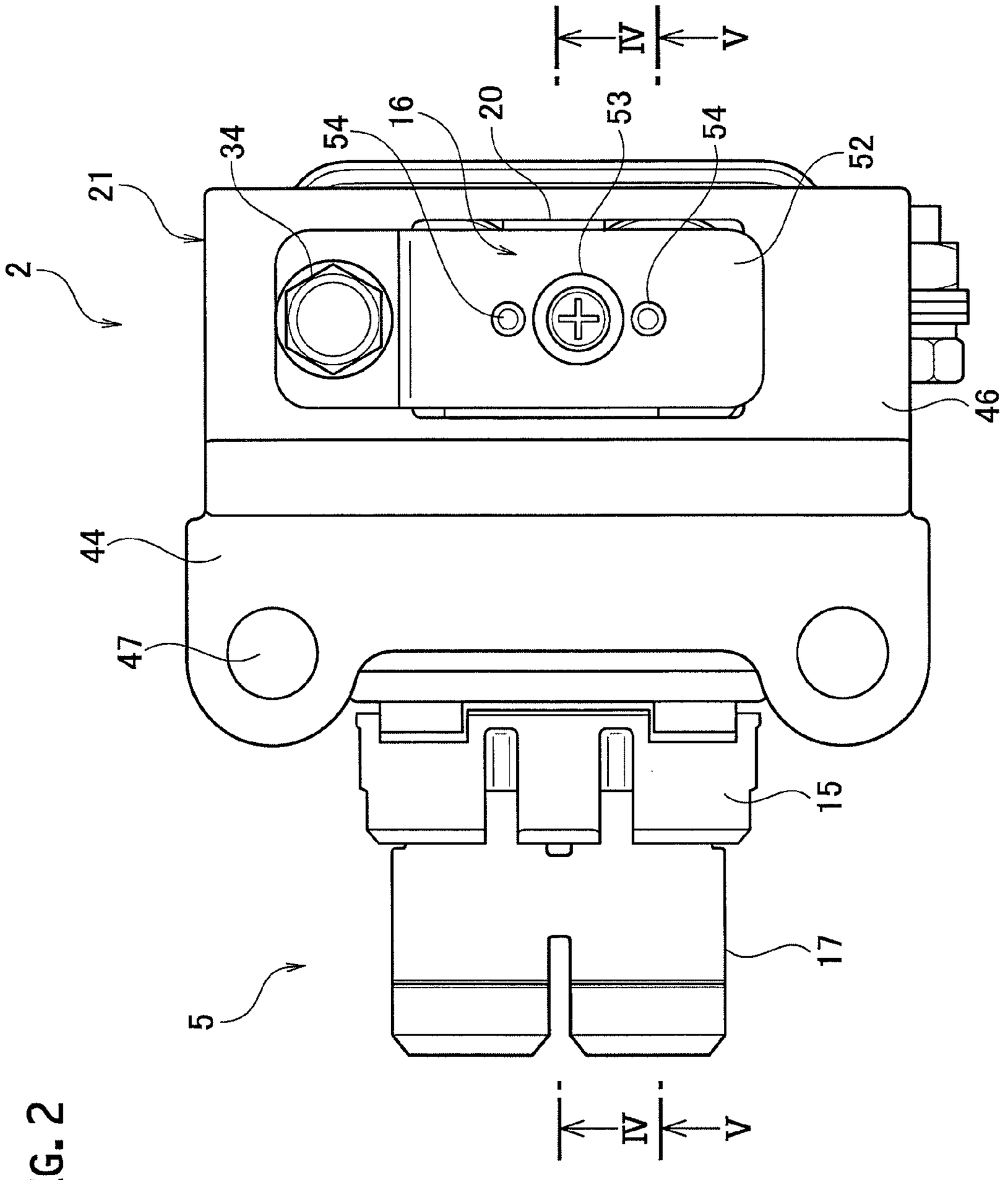

FIG. 2

FIG. 3

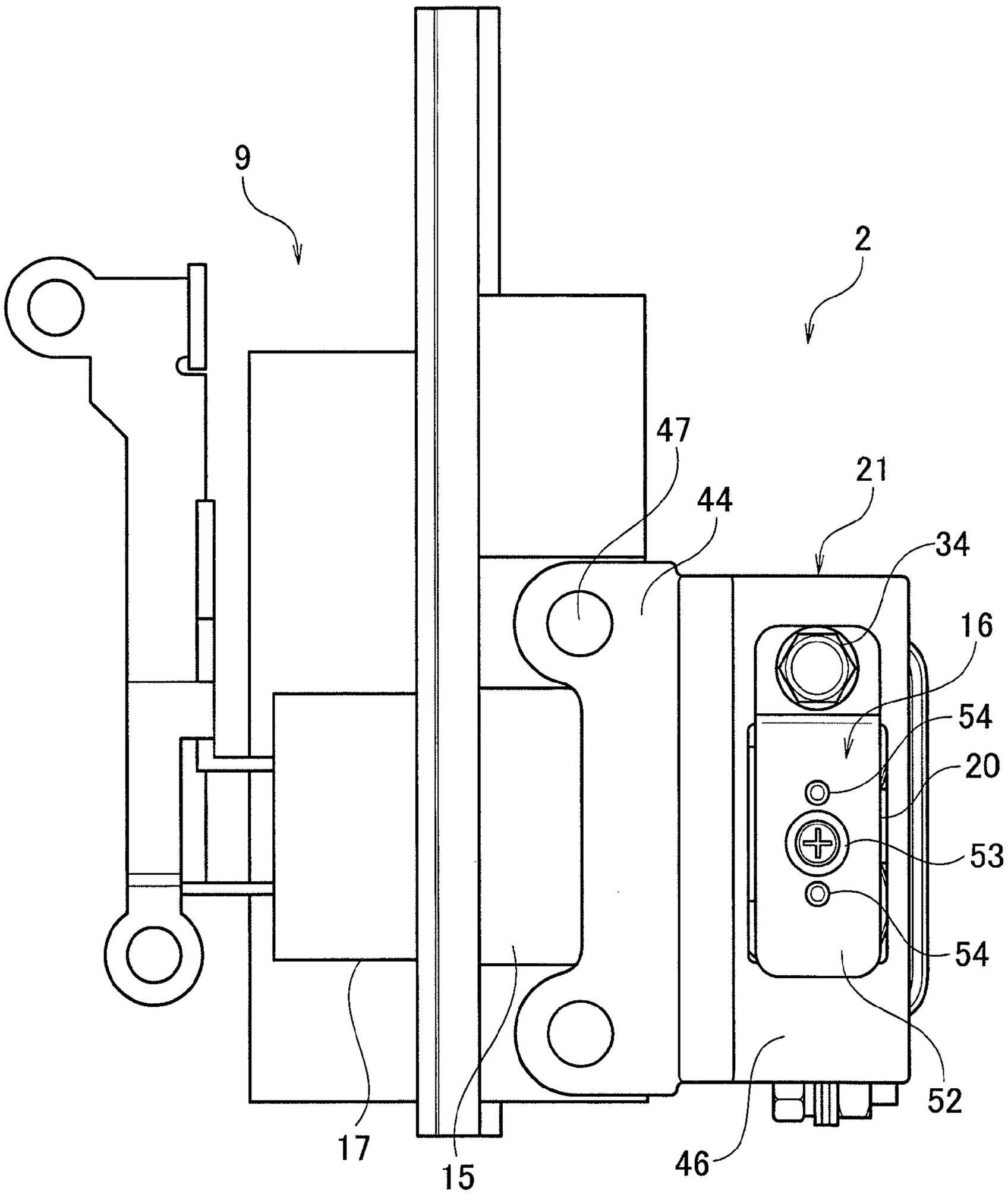

FIG. 4

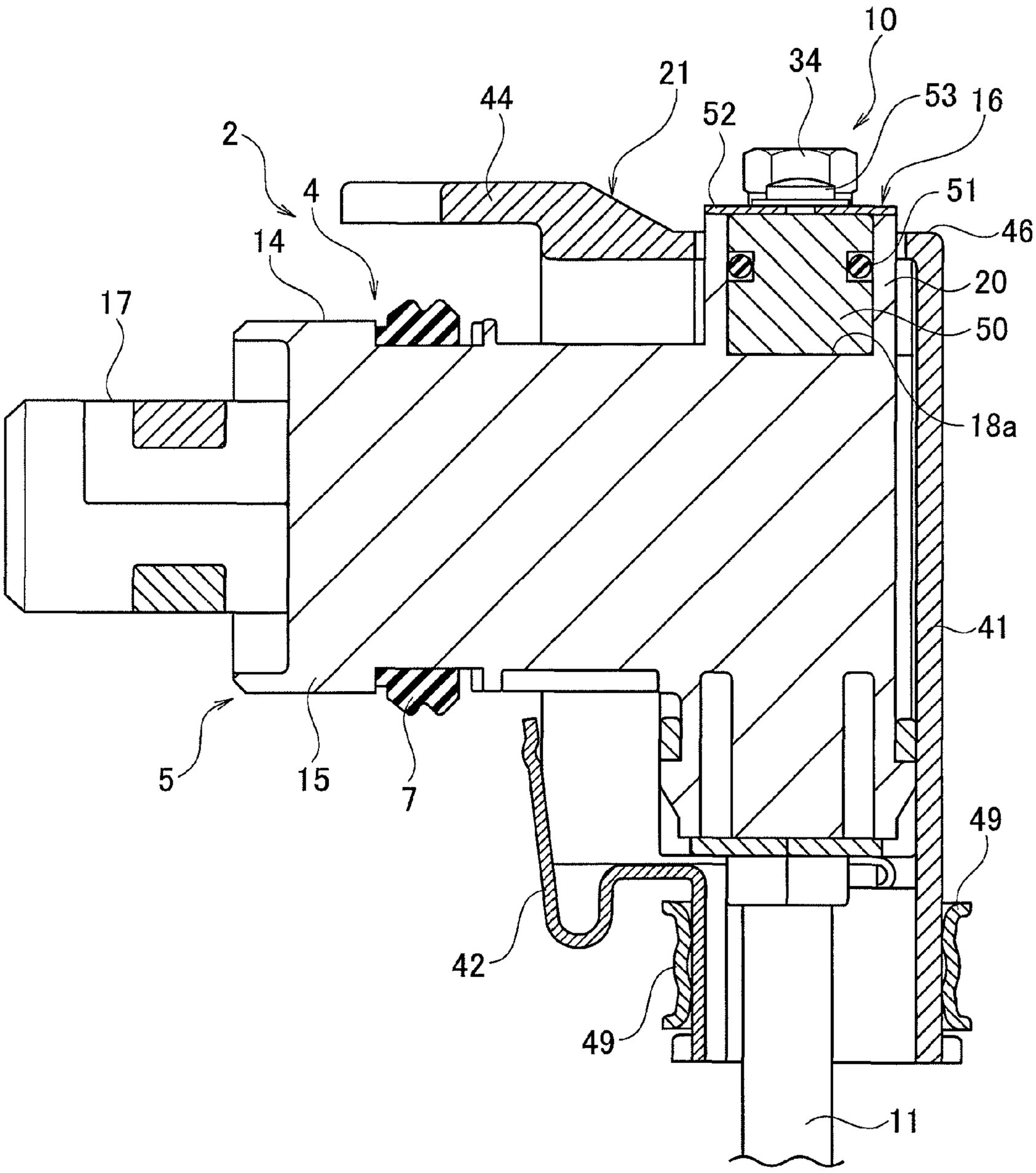

FIG. 5

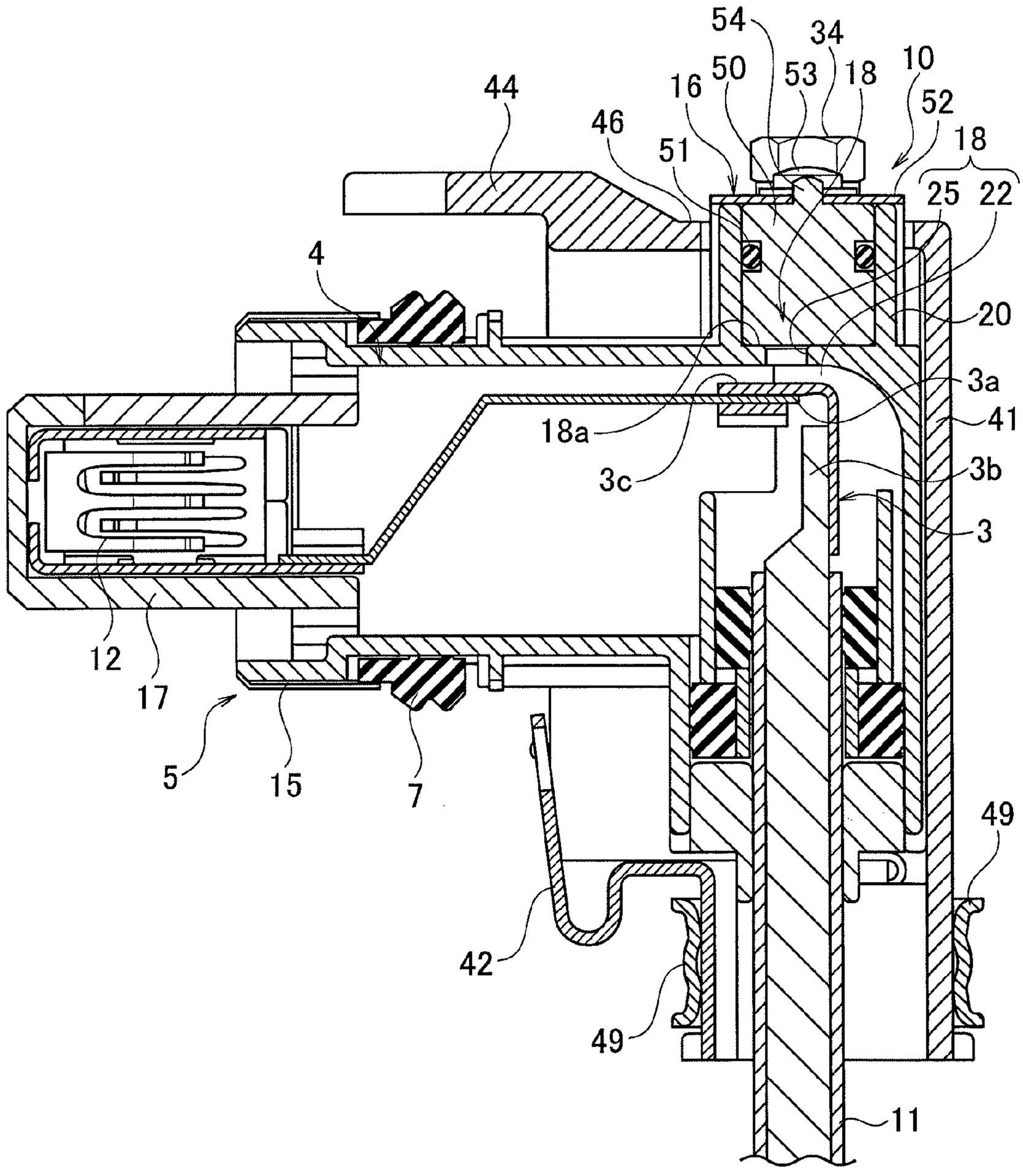
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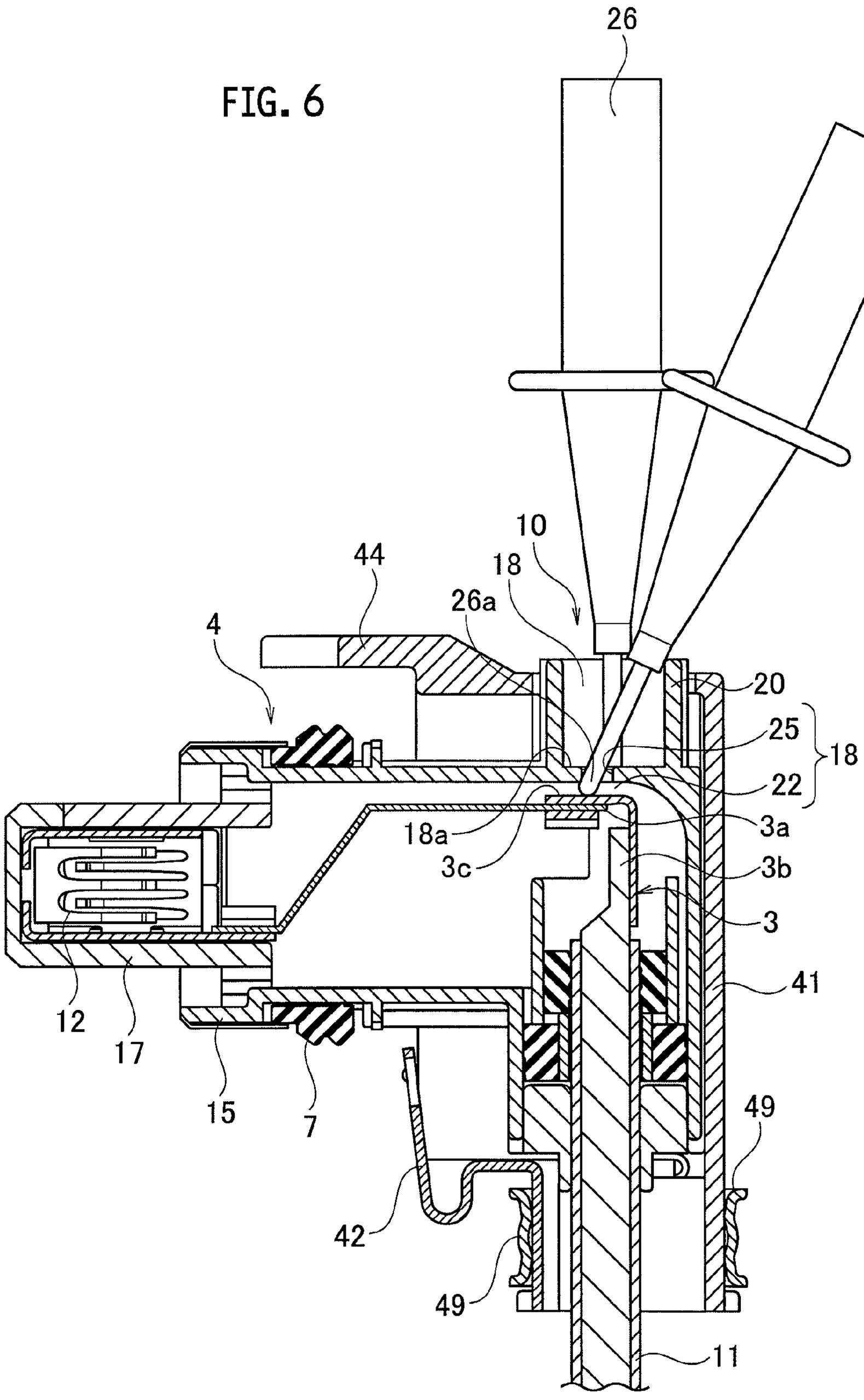
FIG. 6



CONNECTOR

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of PCT Application No. PCT/JP2013/078577, filed on Oct. 22, 2013, and claims the priority of Japanese Patent Application No. 2012-238931, filed on Oct. 30, 2012, the content of both of which is incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to a connector which makes it possible to perform a continuity check and a voltage measurement of a terminal contained in a connector housing.

BACKGROUND ART

In Patent Literature 1, a waterproof shield connector is proposed. This waterproof shield connector is configured such that a terminal contained in a connector housing and a cable end swage-connected to this terminal are covered by first and second sealing members; and, in such a state, the terminal tip, which breaks through the first sealing member and projects to outside, is inserted into an insertion opening of a chassis to be connected to an electric circuit in the chassis. Further, in this waterproof shield connector, the connector housing, the first and second sealing members, the terminal, and a joint portion between the terminal and the cable end are totally shielded by a shield shell.

A continuity check and a voltage measurement of a cable are required to be made for such a connector. In this case, a probe of a measurement instrument is brought into contact with a joint portion between a cable end and a terminal.

As in the above Patent Literature 1, however, if the joint portion between the cable end and the terminal is covered by the first and second sealing members, it is difficult to bring a probe of a measurement instrument into contact with the joint portion between the cable end and the terminal. Hence, when performing the continuity check and/or the voltage measurement, it is necessary to expose the joint portion between the cable end and the terminal to outside by removing the shield shell and the first and second sealing members, and then, bring the probe of the measurement instrument into contact with the exposed portion.

Further, in order to realize the waterproof of such a joint portion between a cable end and a terminal, a type of waterproof connector in which a potting agent is used, and another type of waterproof connector in which the terminal and a portion of the cable end are molded integrally with a connector housing, are also proposed. In such a waterproof connector, however, the terminal and the portion of the cable end are not exposed to outside, and thus, as in the Patent Literature 1, it is impossible to perform the continuity check and the voltage measurement.

CITATION LIST

Patent Literature

Patent Literature 1: Japanese Patent Laid-Open Publication NO. 2010-272404

SUMMARY OF INVENTION

Technical Problem

As described above, for such a waterproof shield connector disclosed in Patent Literature 1, in case of performing the continuity check or the voltage measurement, the terminal and the joint portion between the cable end and the terminal are necessary to be exposed to outside by removing the first and second sealing members, and thus, it is troublesome to perform the continuity check and the voltage measurement.

Further, in a type of waterproof connector filled with a potting agent or another type of waterproof connector integrally molded with a connector housing, it is impossible to perform the continuity check and the voltage measurement.

Thus, the present invention is intended to provide a connector which makes it possible to realize reliable waterproof performance and to easily perform a continuity check and a voltage measurement.

Solution to Problem

A connector according to an aspect of the present invention is a connector provided with a rear connector that includes a rear housing, and a front connector that includes a front housing and that is assembled to the rear connector; the rear housing contains a terminal of a cable end, and the front housing contains a mating terminal to be connected to the terminal; and the rear housing is provided with a checking window through which the terminal is exposed to outside and a voltage of the terminal can be checked, and a waterproof lid which closes the checking window in a sealed state.

In the connector according to the aspect of the present invention, preferably, the checking window is formed of a viewing through-hole which is provided in the rear housing and through which the terminal in the rear housing can be visually recognized externally, and a tube wall which is extended from an opening edge portion of the viewing through-hole; and the waterproof lid is fit to an inside surrounded by the tube wall, in a sealed state.

Preferably, the connector according to the aspect of the present invention further includes a shield shell that covers an outer circumference of the rear connector to shield the rear connector, and the shield shell is provided with an insertion through-hole through which the tube wall is inserted. Further, preferably, the waterproof lid includes a waterproof plug body which is fit to the tube wall inserted through the insertion through-hole, a seal member which is assembled to the waterproof plug body and closely contacts with an inner circumference of the tube wall, a lid plate to which the waterproof plug body is assembled, and which is fixed to the rear housing, and a fixing bolt by which the lid plate is screwed and fixed to the rear housing.

In the connector according to the aspect of the present invention, preferably, the rear housing and the terminal are integrally molded, and the viewing through-hole provided in the rear housing is a hole formed by an extrusion pin which is butted against the terminal and extrudes the rear housing from a molding die when the rear housing and the terminal are integrally molded.

In the connector according to the aspect of the present invention, preferably, the rear housing and the terminal are integrally molded.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is an exploded perspective view illustrating a connector according to an embodiment of the present invention.

FIG. **2** is a plan view illustrating an assembled state of a connector according to an embodiment of the present invention.

FIG. **3** is a plan view illustrating a state in which a connector according to an embodiment of the present invention is attached to a power control electric device (invertor), in an assembled state.

FIG. **4** is a cross-sectional view taken along the line IV-IV of FIG. **2**.

FIG. **5** is a cross-sectional view taken along the line V-V of FIG. **2**.

FIG. **6** is a cross-sectional view illustrating a state in which a continuity check or a voltage measurement is performed through a checking window.

DESCRIPTION OF EMBODIMENTS

Hereinafter, a connector **2** according to an embodiment of the present invention will be described with reference to the drawings. The connector **2** according to this embodiment is a connector for connecting a power control electric device (invertor) **9** (refer to FIG. **3**) to a cable **11**, and supplies electric power from a power source to the power control electric device **9** by being disposed between the power control electric device **9** and the cable **11**.

As shown in FIG. **1**, the connector **2** according this embodiment includes a rear connector **4** including a rear housing **14**; a front connector **5** which includes a front housing (front housing body) **15** and is assembled to the rear connector **4**; and a shield shell **21** which covers the outer circumference of the rear connector **4** to shield the rear connector **4**. The rear housing **14** contains terminals (hereinafter, each referred to as a "plate-like terminal") **3** attached to the ends of the cables **11**, and the front housing **15** contains mating terminals each connected to a corresponding one of the plate-like terminals **3**. The rear housing **14** and the front housing **15** constitute a connector housing.

FIG. **1** illustrates an exploded perspective view of the connector **2** according to this embodiment. The rear housing **14** and the plate-like terminals **3** may be molded as mutually separated components, and then, the molded terminals **3** may be assembled to the molded rear housing **14**. Alternatively, the rear housing **14** and the plate-like terminals **3** may be mutually integrally molded. In the following description, a case where the rear housing **14** and the plate-like terminals **3** are integrally molded will be described. A method of integrally molding the rear housing **14** and the plate-like terminals **3** will be described below.

In the connector **2** according to this embodiment, the rear housing **14** is provided with a checking window **10**, through which the plate-like terminals **3** are exposed to outside and voltages of the plate-like terminals **3** can be checked, and a waterproof lid **16** which closes the checking window **10** in a sealed state.

The plate-like terminals **3** are each connected to a corresponding one of the ends of the cables **11** from a power source. In this embodiment, the cable **11** is formed of a pair of core wires (two core wires), and the plate-like terminals **3** are connected to the ends of the cables **11**, respectively. As shown in FIG. **1**, each of the plate-like terminals **3** is formed of a terminal body **3***a*; a cable-side connection portion **3***b* which is bent at a right angle from the terminal body **3***a* and which is connected to the end of an internal conductor of the cable **11** by being swaged and crimped thereto; and a female-terminal-side connection portion **3***c* which is formed integrally with an opposite side end of the terminal body **3***a* from the cable-side connection portion **3***b* and which is connected to a female terminal **12** described below by being swaged and welded thereto.

The rear connector **4** includes the rear housing **14**, and this rear housing **14** contains therein the plate-like terminals **3** and end portions of the cable **11** connected to the plate-like terminals **3**. The rear housing **14** is formed of an insulating resin. In this rear housing **14**, an attaching portion **14***a* of a long cylindrical outer shape, to which the front connector **5** is assembled, is integrally provided at the front side of the rear housing **14** and, on the outer face of this attaching portion **14***a*, latching convex portions **14***b* for assembling to the front connector **5** are formed. This rear housing **14** is not molded in advance, but is integrally molded, inside a molding die, together with a mold waterproof portion **6** described below during manufacturing of the connector **2**, and results in a configuration shown in FIGS. **2** to **6** through the integral molding.

Further, as shown in FIGS. **1**, **4**, and **5**, the checking window **10** provided in the rear housing **14** is formed of a viewing through-hole **18** through which the plate-like terminals **3** in the rear housing **14** can be visually recognized externally, and a tube wall **20** which is extended from an opening edge portion **18***a* of the viewing through-hole **18**. The viewing through-hole **18** is formed of an internal through-hole **22** provided in the mold waterproof portion **6** molded integrally with the plate-like terminals **3**, and an external through-hole **25** which is provided in the rear housing **14** and which communicates with the internal through-hole **22**. Each of the internal through-hole **22** and the external through-hole **25** is provided at two positions, corresponding to the terminal body portions **3***a*, **3***a* of the two plate-like terminals **3**, **3**, respectively.

These internal through-hole **22** and external through-hole **25** are formed by utilizing a hole which is formed by a butting pin butted against the plate-like terminals **3** when the rear housing **14**, the mold waterproof portion **6**, and the plate-like terminals **3** are integrally molded. Further, the above-described tube wall **20** is provided so as to project from the opening edge portion **18***a* of the external through-hole **25**.

The tube wall **20** is formed in an oval shape in a planar view, and the height thereof is set such that, as shown in FIG. **6**, a tip **26***a* of a probe **26** of a measurement instrument for the continuity check or the voltage measurement can be inserted into the external through-hole **25** in the tube wall **20**, and into the internal through-hole **22**. Moreover, a screw fixing portion **27** is provided in the rear housing **14** adjacent to the tube wall **20**. This screw fixing portion **27** is formed of a rectangular-shaped mounting table **28** which is formed so as to be higher than the outer circumference face of the rear housing **14** by one step, and a screw fixing hole **29** which is formed at the center of the mounting table **28**. These tube wall **20** and screw fixing portion **27** are covered by the shield shell **21** for covering the outer circumference of the rear connector **4** to electromagnetically shield the rear connector **4**, and the tube wall **20** projects to outside through a rectangular-shaped insertion through-hole **30** provided in the shield shell **21**. Further, a screw insertion hole **38** is formed adjacent to the rectangular-shaped insertion through-hole **30** of the shield shell **21**. A fixing bolt **34** screwed into the screw fixing hole **29** of the mounting table **28** is inserted through the screw insertion hole **38**. Further, the above-described waterproof lid **16** is fit to an inside surrounded by the tube wall **20**, in a sealed state.

The waterproof lid **16** is formed of a waterproof plug body **50** which is fit into the tube wall **20**; a seal member (O ring) **51** which is assembled to the waterproof plug body **50** and closely contacts with the inner circumference of the tube wall **20**; a lid plate **52** to which the waterproof plug body **50** is assembled and which is screwed and fixed to the rear housing **14**; and a fixing bolt **34** which fixes the lid plate **52** to the rear

housing **14**. The waterproof plug body **50** is fixed to the lid plate **52** by a fixing screw **53**, and is position-adjusted relative to the lid plate **52** by using positioning projections **54** projecting from the waterproof plug body **50** at both sides of the fixing screw **53**.

Further, as shown in FIG. **5**, in the state in which a head portion of the tube wall **20** projects from the rectangular-shaped insertion through-hole **30** provided in the shield shell **21** and the lid plate **52** is fixed to the rear housing **14** by fixing the lid plate **52** to the mounting table **28** by using the fixing bolt **34**, the lid plate **52** comes into contact with the end face of the tube wall **20** projecting from the shield shell **21**. In this state, the waterproof plug body **50** is fit to the inside of the tube wall **20** and the seal member **51** is in close contact with the inner wall of the tube wall **20**. Thus, the waterproof performance is ensured.

The shield shell **21** covers the outer circumference of the rear connector **4**, and is formed of an upper shell **41** and an under shell **42** each of which is made of metal, such as aluminum.

The upper shell **41** is formed of a box-shaped outer circumference shield wall **43** which contains the rear connector **4**, and a fixing portion **44** which is integrally molded so as to extend in a lateral direction on the upper face of the outer circumference shield wall **43**. The fixing portion **44** is a member for fixing the upper shell **41** to an electric-device case (not illustrated) of an electric device, and has fixing through-holes **47**, through each of which a fixing bolt penetrates, formed on both right and left sides of the fixing portion **44** (refer to FIG. **1**). Further, the upper shell **41** is provided, on an upper face **46**, with the above-described rectangular-shaped insertion through-hole **30** and the screw insertion hole **38** adjacent to the insertion through-hole **30**.

The under shell **42** is formed in a U shape, and is assembled to a lower portion of the upper shell **41**. This assembling is performed by using a pair of holding brackets **49**. This pair of holding brackets **49** is provided so as to sandwich the lower portion of the upper shell **41** and the under shell **42**. The upper shell **41** and the under shell **42** are assembled to each other by, in the state in which the under shell **42** is in contact with the lower portion of the upper shell **41**, sandwiching these by the pair of sandwiching brackets **49**, and joining the pair of holding brackets **49** by using bolts and nuts. Through this assembling of the under shell **42** to the upper shell **41** in such a way as described above, the rear housing **14** is contained inside the shield shell **21** and enters a shielded state.

The front connector **5** is formed of a front housing body **15** (front housing) and a housing front **17**.

The front housing body **15** contains the pair of female terminals **12**. Each of the female terminals **12** is formed in a box shape, and is contained in the front housing body **15**, in a state of being connected to a corresponding one of the plate-like terminals **3**. In the front housing body **15**, in order to contain the female terminals **12**, terminal container chambers **15***c* are formed. The terminal chambers **15***c* are partitioned by a partition wall **15***a*, and this partition wall **15***a* prevents a mutual contact between the female terminals **12** each inserted into a corresponding one of the terminal chambers **15***c*. The front housing body **15** is assembled to the attaching portion **14***a* of the rear housing **14**, and hook portions **15***b*, each of which is associated with a corresponding one of the latching convex portions **14***b* of the attaching portion **14***a*, project toward the rear housing **14**.

The housing front **17** is inserted with mating terminals of the power control electric device. The housing front **17** includes a lower front portion **17***a* and an upper front portion **17***b*, which are capable of being assembled to each other. In the lower front portion **17***a*, mating terminal insertion openings **19**, into each of which a corresponding one of plate-like mating terminals (omitted from illustration) from the power control electric device is inserted, are formed. Each of the mating terminals inserted into a corresponding one of the mating terminal insertion openings **19** is electrically connected to a corresponding one of the box-shaped female terminals **12** contained in the front housing body **15**.

The mold waterproof portion **6** is molded integrally with a surrounding portion of the cable **11**. The mold waterproof portion **6** is provided so as to surround the surrounding portion of the cable **11** including a pair of core wires, and blocks water running on an insulating outer coat of the cable **11** from moving to the plate-like terminal **3** side. In this way, it is possible to prevent the intrusion of water from the surrounding portion of the cable **11**.

The mold waterproof portion **6** is not molded in advance, but is integrally molded inside a molding die during manufacturing of the connector **2**. FIGS. **2** to **4** illustrate a configuration of the mold waterproof portion resulting from integral molding. Through such integral molding, the mold waterproof portion **6** is integrated with the cable **11**, and thus, the mold waterproof portion **6** is joined with the cable **11** more tightly, as compared with a case in which, merely, a seal ring made of rubber or the like is wound around the cable **11**. Thereby, the waterproof performance is extremely improved.

As a material for the mold waterproof portion **6** such as described above, thermosetting elastomer is used. As the thermosetting elastomer, vulcanized gum or thermosetting resin elastomer can be used, and as this thermosetting resin elastomer, polyurethane rubber, silicone rubber, fluorocarbon rubber, or the like, can be optionally selected.

Hereinafter, a manufacturing method for the connector **2** according to this embodiment will be described.

Referring to FIG. **1**, which illustrates a state before integral molding of the mold waterproof portion **6**, each of the plate-like terminals **3** is connected to a corresponding one of ends of a pair of core wires constituting the cable **11**.

The end portions of the cables **11**, to each of which a corresponding one of the plate-like terminals **3** is attached, are set inside a molding die, and heat hardening is performed by injecting a thermosetting elastomer into the molding die. In this way, the mold waterproof portion **6** is molded integrally with the surrounding portion of the end portions of the cables **11**.

After the integral molding of the mold waterproof portion **6**, each of the box-shaped female terminals **12** is connected to a corresponding one of the plate-like terminals **3**. As shown in FIG. **1**, each of the female terminals **12** is formed of a female box-portion connection portion **12***a* of a box shape, and a thin-plate shaped plate-like connection portion **12***b* extended from the female box-portion connection portion **12***a*, and the female-terminal side connection portion **3***c* of the plate-like terminal **3** is swaged and crimped to the plate-like connection portion **12***b*. Thereafter, the female-terminal side connection portion **3***c* is joined with the plate-like connection portion **12***b* by welding. Through this welding, the plate-like terminal **3** and the female terminal **12** result in a state in which they are tightly connected to each other. This tight connection increases the reliability of electric connection.

FIGS. **2** to **6** illustrate a state resulting from integral molding of the rear housing **14**. This integral molding of the rear housing **14** is performed after the integral molding of the mold waterproof portion **6** with the surrounding portion of the end portions of the cables **11** and the connection of the plate-like terminals **3** to the female terminals **12** by welding.

The integral molding of the rear housing **14** is performed by setting the end portions of the cables **11**, around which the mold waterproof portion **6** has been formed, and the plate-like terminals **3** connected to the end portions of the cables **11** inside a molding die; injecting insulating resin into the molding die; and hardening the insulating resin. Through this molding, the mold waterproof portion **6** and the end portions of the cables **11**, around which the mold waterproof portion **6** is provided, result in a state where they are embedded in the rear housing **14**. Thus, the mold waterproof portion **6** results in a state being fixed inside the rear housing **14**, and the separation of the mold waterproof portion **6** from the cable **11** is blocked. Accordingly, the state in which the mold waterproof portion **6** is in close contact with the surrounding portion of the cable **11** can be kept, and thus, the prevention of water intrusion can be reliably achieved by the mold waterproof portion **6**.

After the integral molding of the mold waterproof portion **6** with the ends of the cables **11** and the integral molding of the rear housing **14** with the mold waterproof portion **6**, the front housing body **15** is assembled to the rear housing **14**. During this assembly, the front connector **5** is formed by assembling the housing front **17**, and inserting the assembled housing front **17** into the front housing body **15**. In addition, a seal ring **7** made of rubber is disposed between the front housing body **15** and the housing front **17**.

Thereafter, the front housing body **15** is assembled to the attaching portion **14***a* of the rear housing **14** while inserting the female terminals **12** into the terminal container chamber **15***c* of the front housing body **15**. At this time, each of the hook portions **15***b* is latched to a corresponding one of the latching convex portions **14***b* such that the seal ring **7** made of rubber is sandwiched therebetween.

Next, the rear connector **4** is contained in the shield shell **21**. At this time, the tube wall **20** provided in the rear housing **14** is inserted through the inside of the insertion through-hole **30** of a rectangular shape. In this state, the under shell **42** is assembled to the upper shell **41** by using the holding brackets **49**, and, as a result, the rear connector **4** is contained and held inside the shield shell **21**. Subsequently, the waterproof plug body **50** is fit to the inside of the tube wall **20**, and the seal member **51** is brought into close contact with the inner wall of the tube wall **20**. Next, the fixing bolt **34** is inserted through the inside of the insertion hole **38** and is screwed into the fixing screw hole **29** of the rear housing **14**. As a result, as shown in FIGS. **4** and **5**, the lid plate **52** comes into contact with the end face of the tube wall **20**.

In such a way as described above, the connector **2** is assembled such as shown in FIGS. **2** and **3**. Next, when a continuity check or a voltage measurement is performed, as shown in FIG. **6**, the fixing bolt **34** is removed from the fixing screw hole **29**, and the waterproof lid **16** is removed from the inside of the tube wall **20**. In the state in which the waterproof lid **16** is removed from the inside of the tube wall **20**, the terminal body portions **3***a* of the plate-like terminals **3** are exposed to outside through the external through-hole **25** and the internal through-hole **22**. Further, the probe **26** of a measurement instrument for the continuity check and/or the voltage measurement is inserted through the external through-hole **25** and the internal through-hole **22**, and thereby, the tip **26***a* is brought into contact with one of the terminal body portions **3***a*

After the completion of the continuity check and/or the voltage measurement, the external through-hole **25** and the internal through-hole **22** are closed in a sealed state by fitting the waterproof lid **16** to the inside of the tube wall **20**, and clamping the fixing bolt **34** into the fixing screw hole **29**.

As described above, according to this embodiment, in the connector **2** in which the plate-like terminals **3** are contained in the rear housing **14**, the checking window **10** is closed in a sealed state by the waterproof lid **16**, and thus, reliable waterproof performance can be realized. Further, in the connector **2**, the plate-like terminals **3** are exposed to outside by opening the checking window **10**, and thus, through a method of bringing the tip **26***a* of the probe **26** of a checking instrument or a measurement instrument into contact with one of the plate-like terminals **3** through the checking window **10**, the continuity check and/or the voltage measurement can be easily performed. Accordingly, the existing problem in that it is troublesome to perform the continuity check and/or the voltage measurement, as well as the existing problem in that it is difficult to make the continuity check and/or the voltage measurement, can be solved. Further, reliable waterproof performance can be realized and, simultaneously therewith, the continuity check and the voltage measurement can be easily performed.

Further, according to this embodiment, when performing the continuity check and/or the voltage measurement, the plate-like terminals **3** are exposed to outside through the viewing through-hole **18** merely by removing the waterproof lid **16** in the state of being fit to the inside of the tube wall **20** provided at the opening edge portion **18***a* of the viewing through-hole **18**, and thus, the continuity check and/or the voltage measurement can be easily performed. Further, reliable waterproof performance can be realized by fitting the waterproof lid **16** to the inside of the tube wall **20**.

Moreover, the waterproof plug body **50** can be removed from the inside of the tube wall **20** by removing the fixing bolt **34** which is screwed and fixed to the rear housing **14**, and removing the lid plate **52** from the shield shell **21**, and in this state, the plate-like terminals **3** are exposed to the outside through the internal through-hole **22** provided inside the tube wall **20**. After the continuity check or the voltage measurement has been performed in such a state in which the plate-like terminals **3** are exposed to the outside, through a method of inserting the waterproof plug body **50** into the tube wall **20** again and fixing the lid plate **52** to the rear housing **14** by using the fixing bolt **34**, the waterproof plug body **50** is fit to the inside of the tube wall **20** and the seal member **51** comes into close contact with the inside of the tube wall **20**, thereby enabling realization of reliable waterproof performance.

Further, through a method of applying a hole, which is formed by a butting pin butted against the terminals **3** during the process of molding the rear housing **14** integrally with the terminals, to the viewing through-hole **18** through which the terminals **3** are exposed to outside in the tube wall **20**, any particular through-hole for the exposure of the terminals is unnecessary to be provided in design of the rear housing **14**. Through this method, the structure of a molding die for molding the rear housing becomes simple and, as a result, manufacturing costs for the die and the connector can be reduced.

Moreover, in this embodiment, the mold waterproof portion **6** is molded integrally with the surrounding portion of the ends of the cables **11**, and thus, the mold waterproof portion **6** is brought into a state of being in close contact with the insulating outer coat of the cable **11** and is tightly joined with the cable **11**. Thus, water running on the cable **11** is blocked by the mold waterproof portion **6**, and thus, the prevention of the water intrusion can be reliably achieved. Further, since the cable **11** involving the mold waterproof portion **6** is molded integrally with the rear housing **14**, the mold waterproof portion **6** is embedded integrally with the rear housing **14**, and thus, the state in which the mold waterproof portion **6** is in close contact with the cable **11** can be kept. Further, this leads

to increase of the power of prevention by the mold waterproof portion **6** on the water intrusion **6**.

In such an embodiment as described above, a waterproof structure is realized by molding the mold waterproof portion **6** integrally with the surrounding portion of the ends of the cables **11** and molding the cable **11** involving the mold waterproof portion **6** integrally with the rear housing **14**, and thus, the number of parts required to realize the waterproof structure does not increase, and the size of the connector **2** does not increase, either. Moreover, the rear housing **14** is molded integrally with the mold waterproof portion **6** and the cable **11** which have been integrally molded, and thus, the number of assembly processes decreases and the manufacturing becomes easy.

In addition, in this embodiment, a case where the cable **11** is formed of a pair of core wires has been described and, besides, the present invention can be applied to a continuity check and/or a voltage measurement on terminals connected to a coaxial cable.

Further, in this embodiment, a connector in which the rear housing **14** and the plate-like terminals **3** are integrally molded has been described and, besides, the present invention can be applied to a connector which results from molding the rear housing **14** and the plate-like terminals **3** as separated components and assembling the plate-like terminals **3** to the molded rear housing **14**. That is, the present invention can be applied to all types of connector in each of which terminals are contained in a connector housing.

Hereinbefore, embodiments according to the present invention have been described, but these embodiments are just exemplifications which have been described in order to make it easy to understand the present invention, and the present invention is not limited to these embodiments. The technical scope of the present invention is not limited to the specific technical respects having been disclosed in this embodiment, but encompasses various modifications, changes, alternative technologies and the like, which can be easily derived therefrom.

INDUSTRIAL APPLICABILITY

In a connector housing containing one or more terminals, since a connector including the connector housing is configured such that a checking window is closed in a sealed state by a waterproof lid, it is possible to realize reliable waterproof performance, and since the connector is configured such that, by opening the checking window, the one or more terminals enter a state in which they are exposed to outside, it is possible to perform a continuity check and/or a voltage measurement. Accordingly, it is possible to solve an existing problem in that the continuity check and the voltage measurement are troublesome, as well as another existing problem in that it is difficult to perform the continuity check and the voltage measurement; and further, it is possible to realize reliable waterproof performance and, simultaneously therewith, perform the continuity check and the voltage measurement easily.

REFERENCE SIGNS LIST

2 connector
3 plate-like terminal
4 rear connector
5 front connector
10 checking window
14 rear housing
15 front housing
16 waterproof lid
18 viewing through-hole
30 insertion through-hole

The invention claimed is:

1. A connector comprising:
a rear connector that includes a rear housing; and
a front connector that includes a front housing and that is assembled to the rear connector,
wherein the rear housing contains a terminal of a cable end, and the front housing contains a mating terminal to be connected to the terminal, and
wherein the rear housing is provided with
a checking window through which the terminal is exposed to outside, and a voltage of the terminal can be checked, and
a waterproof lid which closes the checking window in a sealed state.

2. The connector according to claim **1**,
wherein the checking window is formed of:
a viewing through-hole which is provided in the rear housing and through which the terminal in the rear housing can be visually recognized externally; and
a tube wall extended from an opening edge portion of the viewing through-hole, and
wherein the waterproof lid is fit to an inside surrounded by the tube wall, in a sealed state.

3. The connector according to claim **2**, further comprising
a shield shell that covers an outer circumference of the rear connector to shield the rear connector,
wherein the shield shell is provided with an insertion through-hole through which the tube wall is inserted, and
wherein the waterproof lid includes:
a waterproof plug body which is fit to the tube wall inserted through the insertion through-hole;
a seal member which is assembled to the waterproof plug body and closely contacts with an inner circumference of the tube wall;
a lid plate to which the waterproof plug body is assembled and which is fixed to the rear housing; and
a fixing bolt by which the lid plate is screwed and fixed to the rear housing.

4. The connector according to claim **2**, wherein
the rear housing and the terminal are integrally molded, and
the viewing through-hole provided in the rear housing is a hole formed by an extrusion pin which is butted against the terminal and extrudes the rear housing from a molding die when the rear housing and the terminal are integrally molded.

5. The connector according to claim **1**, wherein the rear housing and the terminal are integrally molded.

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